

IN THE CLAIMS:

Please amend Claims 4, 5, 7, 8, 10, 11, 14, 18, 19, 22-24, 26, 29-35, 39 and 42 and add new Claims 43-45 as follows.

1. (Original) A photographic apparatus for taking images of an object for use in generating a three dimensional model of the object, the photographic apparatus comprising an object placing unit for placing the object, an image capturing unit for capturing images of the object for use in generating the three dimensional model, and an illumination unit, the image capturing unit and the illumination unit being connectedly moveable relative to the object placing unit such that, in use, the object may be placed by the placing unit both in the field of view of the image capturing unit and in a position where the illumination unit is capable of providing illumination for the image capturing device to take silhouette images of the object.

2. (Original) An apparatus as claimed in claim 1, wherein the image capturing unit and the illumination unit are arranged to be rotatably moved about an axis of rotation such that, whatever angle the image capturing unit is at relative to the object, the object is positioned so that the illumination unit is capable of illuminating a side of the object opposite to a side thereof facing the image capturing device.

3. (Original) An apparatus as claimed in claim 2, wherein said placing unit includes a transparent table on which the object is placed, and said axis of rotation is closely located above the table.

4. (Currently Amended) An apparatus as claimed in ~~any preceding~~ claim 1, wherein the placing unit includes a rotatable turntable to enable the image capturing unit to be used to take images of the object at two or more different orientations.

5. (Currently Amended) An apparatus as claimed in ~~any preceding~~ claim 1, wherein the image capturing unit is used to take both silhouette and textural images of the object, wherein the illumination unit provides different illumination when textural images are taken from when the silhouette images are taken.

6. (Original) An apparatus as claimed in claim 5, wherein the image capturing unit takes two or more silhouette images of the object at different orientations in a first period and two or more textural images of the object at different orientations in a second period, the first and second periods being non-overlapping.

7. (Currently Amended) An apparatus as claimed in claim 5 ~~or 6~~, further comprising another illumination unit attached to said image capturing unit for providing illumination for the image capturing device to take textural images.

8. (Currently Amended) An apparatus as claimed in ~~any preceding~~ claim 1, wherein the image capturing unit includes an image capturing device and an optical device, and the optical device deflects an optical axis extending from the object to the image capturing device.

9. (Original) An apparatus as claimed in claim 8, wherein a relative angle of the optical device and the image capturing device is adjustable in order to move an image of the object towards the centre of an optical view of the image capturing device.

10. (Currently Amended) An apparatus as claimed in claim 9, wherein the relative angle of the optical device and the image capturing device is dependent on the angle of the image capturing device relative to the object and/or on the size of said object.

11. (Currently Amended) An apparatus as claimed in ~~any preceding~~ claim 1, wherein said illumination unit is mounted between a right illumination arm and a left illumination arm, the image capturing unit is mounted between a right camera arm and a left camera arm, said right illumination arm and said right camera arm meet at a right arm joint, and said left illumination arm and said left camera arm meet at a left arm joint, and the apparatus further comprising an arm drive, wherein said arm drive is arranged to rotate said illumination and camera arms so as to rotate said illumination unit and said image capturing unit about an axis of rotation.

12. (Original) An apparatus as claimed in claim 11, wherein said placing unit includes a transparent table on which the object is placed, and, in use, the image capturing unit is settable to at least four angles relative to the table.

13. (Original) An apparatus as claimed in claim 12, wherein, in use, said image capturing unit takes relatively large number of images of said object when said image capturing unit is at a lower angle relative to the table and takes a relatively small number of images of said object when said image capturing unit is at a greater angle relative to the table.

14. (Currently Amended) An apparatus as claimed in ~~any preceding~~ claim 1, wherein, in use, an exposure parameter of said image capturing unit is set such that the resulting image is underexposed when said image capturing unit is capturing silhouette data.

15. (Original) A method of generating a three dimensional model of an object, the method comprising the steps of:

placing the object using a placing unit such that the object is in the field of view of an image capturing unit capturing an image of the object, wherein the image capturing unit and an illumination unit are connectedly moveable relative to the placed object;

taking a plurality of silhouette images of the object using the image capturing unit, with the illumination unit providing illumination for the image capturing device to take the silhouette images of the object; and

using the plurality of images to generate a three dimensional model of the object.

16. (Original) A method as claimed in claim 15, wherein the image capturing unit and the illumination unit are rotatably mounted about an axis of rotation such that, whatever angle the image capturing unit is at relative to the object, the object is positioned between the image capturing unit and the illumination unit.

17. (Original) A method as claimed in claim 16, wherein said centre of rotation is closely located above a table on which the object is placed.

18. (Currently Amended) A method as claimed in ~~any one of claims 15 to 17~~ claim 15, wherein the placing unit includes a turntable and is rotatable to enable the image capturing unit to be used to take images of the object at two or more different orientations.

19. (Currently Amended) A method as claimed in ~~any one of claims 15 to 18~~ claim 15, wherein the image capturing unit includes an image capturing device and an optical device, and the optical device deflects an optical axis extending from the object to the image capturing device in said step of taking a plurality of silhouette images.

20. (Original) A method as claimed in claim 19, wherein the image capturing device and the optical device are relatively tiltable in order to move an image of the object towards the centre of an optical view of the image capturing device in said step of taking a plurality of silhouette images.

21. (Original) A method as claimed in claim 20, wherein the magnitude and direction of the tilt is dependent on the angle of the image capturing device relative to the object and/or on the size of said object.

22. (Currently Amended) A method as claimed in ~~any one of claims 15 to 21~~, claim 15 further comprising a step of performing a calibration subroutine to generate calibration data prior to the step of placing said object, wherein said calibration subroutine comprises the steps of:

placing a calibration pattern in the field of view of the image capturing unit; and

taking a plurality of images of the calibration pattern using the image capturing unit.

23. (Currently Amended) A method as claimed in claim 22, ~~when dependent on claim 20~~, wherein the images of the calibration pattern are taken from every orientation at which said silhouette images are to be taken of an object to be modelled.

24. (Currently Amended) A method as claimed in ~~any one of claims 15 to 23~~ claim 15, further comprising a step of taking a plurality of textural images of the object to be modelled from different orientations, wherein said illumination unit provides less illumination for the textural images than for the silhouette images.

25. (Original) A method as claimed in claim 24, wherein, a period for said step of taking the silhouette images and a period for said step of taking the textural are non-overlapping.

26. (Currently Amended) A method as claimed in claim 24 ~~or claim 25~~, wherein another illumination unit attached to said image capturing unit is provided to provide illumination for the image capturing device to take the textural images of the object.

27. (Original) A photographic apparatus for taking images of an object for use in generating a three dimensional model of the object, the photographic apparatus comprising an object placing unit for placing the object and an image capturing unit for capturing images of the object for use in generating the three dimensional model, the image capturing unit including an image capturing device and an optical device to deflect an optical axis extending from the object to the image capturing device, the apparatus being arranged such that, in use, the image capturing unit is arranged to be rotatably moved about an axis or rotation such that, whatever

angle the image capturing unit is at relative to the object the object may be placed by the object placing unit in the field of view of the image capturing device.

28. (Original) An apparatus as claimed in claim 27, wherein the optical device deflects the optical axis by around 90 degrees.

29. (Currently Amended) An apparatus as claimed in claim 27 ~~or claim 28~~, wherein a relative angle of the optical device and the image capturing device is adjustable in order to move an image of the object towards the centre of an optical view of the image capturing device.

30. (Currently Amended) An apparatus as claimed in claim 29, wherein the relative angle of the optical device and the image capturing device is dependent on the angle of the image capturing device relative to the object and/or on the size of said object.

31. (Currently Amended) An apparatus as claimed in claim 29 ~~or claim 30~~, wherein the object placing unit includes a table on which the object is placed, and the angle of deflecting the optical axis is greater ~~when~~ in the case that the angle of image capturing device relative to the turntable is smaller.



32. (Currently Amended) An apparatus as claimed in ~~any one of claims 27 to 31~~ claim 27, further comprising an illumination unit being connectedly moveable with the image capturing unit relative to the object placing unit such that, in use, the object may be placed by the placing unit both in the field of view of the image capturing unit and in a position where the illumination unit is capable of providing illumination for the image capturing device to take silhouette images of the object.

33. (Currently Amended) An apparatus as claimed in ~~any one of claims 27 to 32~~ claim 27, wherein the placing unit includes a rotatable turntable to enable the image capturing unit to be used to take images of the object at two or more different orientations.

34. (Currently Amended) A system for generating three dimensional models of an object, the system comprising an apparatus as claimed in ~~any one of claims 1 to 14 or any one of claims 27 to 33~~ claim 1, the system further comprising control means for obtaining image data and means for generating a three dimensional model from said images.

35. (Original) A system as claimed in claim 34, wherein said control means includes a graphical user interface, a display for displaying information for an operator, and input means to enable an operator to communicate with the system.

36. (Original) A photographic apparatus for taking images of an object for use in generating a three dimensional model of the object, the photographic apparatus comprising an object placing unit for placing the object and an image capturing unit for capturing images of the object for use in generating the three dimensional model, an optical focal length of the image capturing unit being variable in accordance with a size of the object placed by the placing unit in the field of view of the image capturing unit.

37. (Original) An apparatus as claimed in claim 36, wherein the optical focal length is manually selectable depending on at least one of a width, a depth, and a height of the object.

38. (Original) An apparatus as claimed in claim ~~38~~ 36, further comprising a display for showing a user interface through which the optical focal length is selected.

39. (Currently Amended) An apparatus as claimed in ~~any one of claims 36 to 38~~ claim 36, wherein a photographing position or orientation of the image capturing unit is variable in accordance with the size of the object.

40. (Original) An apparatus as claimed in claim 39, wherein the image capturing unit comprises an image capturing device and an optical device for deflecting an optical axis extending from the object to the image capturing device, a relative angle of the image

capturing device and the optical device is varied in accordance with the size of the object for varying the photographic position or orientation.

41. (Original) An apparatus as claimed as claim 40, wherein the relative angle of the optical device and the image capturing device is dependent on the angle of the image capturing device relative to the object and on the size of said object.

42. (Currently Amended) An apparatus as claimed as ~~any one of claims 36 to 41~~ in claim 36, wherein the image capturing unit is calibrated for each optical focal length.

43. (New) An apparatus as claimed in claim 30, wherein the object placing unit includes a table on which the object is placed, and the angle of deflecting the optical axis is greater in the case that the angle of image capturing device relative to the turntable is smaller.

44. (New) A system for generating three dimensional models of an object, the system comprising an apparatus as claimed in claim 27, the system further comprising control means for obtaining image data and means for generating a three dimensional model from said images.

45. (New) A system as claimed in claim 44, wherein said control means includes a graphical user interface, a display for displaying information for an operator, and input means to enable an operator to communicate with the system.